Novel *Pseudomonas fluorescens* Septic Sacroiliitis in a Healthy Soldier

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ABSTRACT Septic sacroiliitis is an uncommon infection of immunocompetent patients, typically caused by gram-positive bacteria, with fewer gram-negative cases, and only 5% attributed to *Pseudomonas* species. We present a healthy soldier with the first reported case of *Pseudomonas fluorescens* septic sacroiliitis and discuss unique diagnostic and management issues. Because of its rare incidence and nonspecific presentation, septic sacroiliitis is often unrecognized, and its diagnosis is often delayed. Increased awareness of septic sacroiliitis as a potential disease process in the differential diagnosis of troops presenting with a combination of fever, low-back pain, and weight-bearing difficulty is important. As the young age and trauma exposure of the military population represent a prime demographic for this often unrecognized infection, delayed diagnosis can negatively impact a soldier's military readiness. *P. fluorescens* is itself a rare pathogen and often misidentified in the laboratory. Enhanced microbiological diagnostic techniques beyond routine culture and susceptibility testing should also be considered to account for less commonly seen pathogens. Although optimal antimicrobial treatment duration for infectious sacroiliitis is not well established, this case shows the early efficacy of oral antibiotics.

INTRODUCTION

Because of its rare incidence and nonspecific presentation, septic sacroiliitis is often unrecognized, and its diagnosis is often delayed. *Pseudomonas fluorescens* is itself a rare pathogen and often misidentified in the laboratory. This first reported case of *P. fluorescens* septic sacroiliitis highlights potential microbiological and diagnostic pitfalls and shows a rapid clinical and radiologic response to targeted oral antimicrobial therapy.

CASE REPORT

A 26-year-old white male soldier presented with left lower-back pain and severely limited ambulation. Over the previous year, he had reported chronic, moderate, bilateral low-back pain after a fall during combat training, and had evidence of degenerative lumbar disk disease on magnetic resonance imaging (MRI) 10 months before this case presentation and hospitalization. Two months before hospitalization, he presented to an emergency department with a low-back pain exacerbation that was unresponsive to increasing oral narcotic use. At that time, he described constant, sharp, stabbing pain in his left lower back, with radiation to his left lateral thigh, and required a walker for ambulation. He also reported lower abdominal pain and intermittent non-bloody diarrhea. Laboratory studies were unremarkable, concurrent abdominal computed tomography (CT) and lumbar MRI showed no acute pathology or sacroiliac (SI) joint involvement, and a colonoscopy with random rectal mucosal biopsy was normal. Two months later, he experienced an acute episode of excruciating, focal left sacroiliac pain after a fall from a seated height of two feet, necessitating this hospital admission. He denied gastrointestinal or constitutional symptoms at the time of this presentation. His past medical and surgical histories were otherwise negative, and he denied tobacco, alcohol, or intravenous drug use. His family history was significant for psoriatic arthritis and Crohn's disease. He was afebrile, and vital signs were within normal limits. There was prominent tenderness and guarding with light palpation of the left SI joint; more comprehensive orthopedic testing maneuvers were precluded by his pain severity with even the slightest hip or left leg movement. Left leg mobility was markedly limited because of pain, but there were no focal neurologic deficits.

Admission laboratory values showed normal hematologic and metabolic parameters. Erythrocyte sedimentation rate (ESR) was 35 mm/h (upper limit of normal 20 mm/h) and C-reactive protein (CRP) was 3.5 mg/dL (upper limit of normal 0.5 mg/dL). HLA-B27 and HIV antibodies were negative. MRI showed left SI joint effusion with erosive changes and

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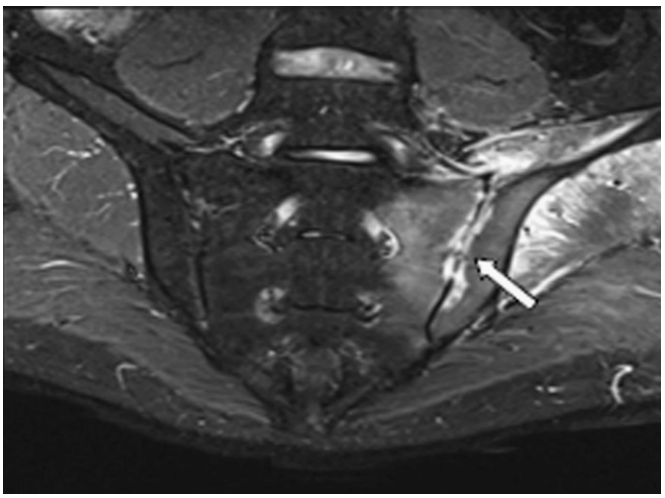

FIGURE 1. Admission MRI, demonstrating effusion, erosive changes, and bone marrow edema of the left sacroiliac joint, and muscle edema of the left iliacus and gluteus medius.

associated bone marrow edema, along with adjacent muscular edema involving the iliacus and gluteus medius muscles (Fig. 1). A CT-guided arthrocentesis of his left SI joint was performed at our facility on hospital day (HD) 4, with sterile saline (Becton Dickinson, Franklin Lakes, New Jersey) injected to increase aspirate yield (Fig. 2). Aspiration produced 1 mm purulent, bloody fluid, containing 4,959 nucleated cells/μL, of which 99% were polymorphonuclear cells. Microscopic examination revealed no crystals. Intravenous piperacillin/tazobactam and vancomycin were started empirically after the procedure.

Gram stain of SI joint fluid showed gram-negative rods, and culture revealed sweet-smelling, β-hemolytic, greenish gray pure colonies that grew on Trypticase Soy Agar with 5% sheep blood (Remel, Lenexa, Kansas) and MacConkey agar (Remel). The isolate was positive for oxidase and did not ferment lactose. Automated testing on the VITEK II system using the ID-GNB card (bioMérieux, Durham, North

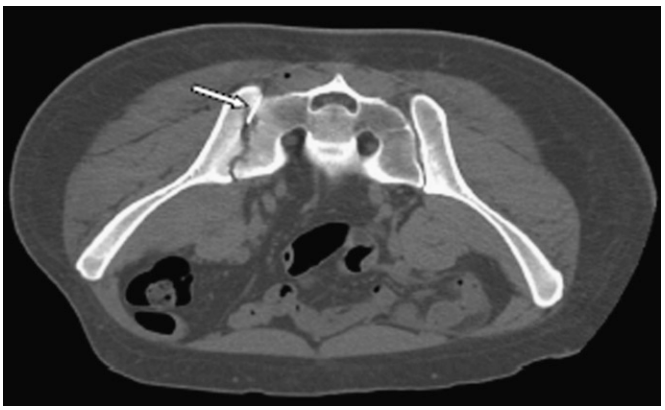

FIGURE 2. CT-guided arthrocentesis of the left sacroiliac joint, demonstrating intra-articular placement of a spinal needle and erosive disease (patient in prone position).

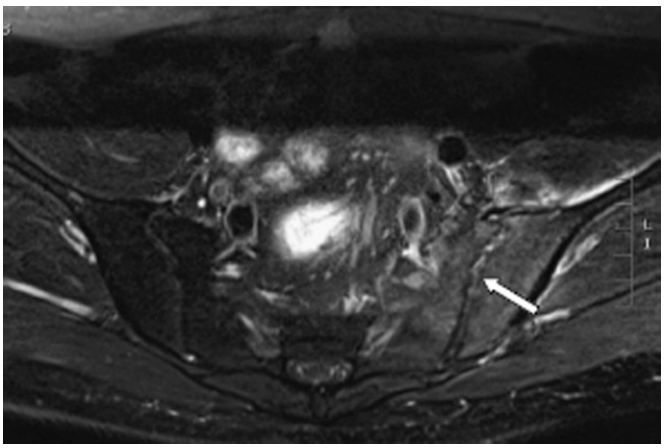

FIGURE 3. Two-week follow-up MRI, showing interval decrease in bone marrow edema and inflammatory changes of the left sacroiliac joint.

Carolina) identified the isolate as a *Burkholderia* species. Confirmatory testing, however, revealed no growth on *Burkholderia cepacia* selective agar (Remel), and the isolate showed growth at 4°C. Additional testing with the Analytical Profile Index 20NE system (bioMérieux) identified the organism as *P. fluorescens* with a percent identification of >90%, reflecting a good species-level identification. According to automated susceptibility testing, the organism was susceptible to aminoglycosides, cefepime, ciprofloxacin, colistin, and imipenem, and resistant to trimethoprim/sulfamethoxazole and minocycline.

The patient reported daily improvement in pain and lower extremity mobility. On HD 7, antimicrobial therapy was narrowed to oral ciprofloxacin 750 mg twice daily. He showed continued clinical improvement, ambulating with minimal assistance, and his inflammatory markers decreased (ESR 20 mm/h; CRP <0.5 mg/dL) by HD 9. He was discharged on HD 11, on an anticipated 12-week-minimum course of oral ciprofloxacin. Two weeks after discharge, he was clinically improved, able to ambulate without assistance, his pain was controlled using oral agents, and inflammatory markers were normal (ESR 4 mm/h; CRP <0.5 mg/dL). Follow-up MRI 2 weeks after initiation of antibiotic therapy showed decreased bone marrow and soft tissue edema at the level of the left SI joint (Fig. 3). The patient did not return for scheduled outpatient follow-up and monitoring thereafter.

DISCUSSION

To the best of our knowledge, this is the first reported case of bacterial septic sacroiliitis because of *P. fluorescens*. It illustrates microbiological and clinical diagnostic pitfalls, as well as a favorable short-term clinical response to targeted oral antimicrobial therapy. *P. fluorescens* is an aerobic gram-negative rod that tends to be less virulent than *P. aeruginosa*.[1,2] Although *P. fluorescens* is environmentally ubiquitous, it is an uncommon cause of infection, especially in immunocompetent

individuals,[1–3] and is rarely associated with osteomyelitis.[4,5] The organism has been implicated as a cause of pseudobacteremia and transfusion-related bacteremia[1,2] and was also identified as the cause of a multistate outbreak of catheter-related bloodstream infections in oncology patients, the source of which was traced to contaminated, commercial heparinized saline flushes.[6]

Given the reported role of *P. fluorescens* in iatrogenic bacteremia,[6] and the use of a sterile saline flush to obtain the diagnostic aspirate in our case, we performed cultures of prepackaged sterile saline syringes from the same lot as those used for the patient's sacroiliac arthrocentesis. No bacterial pathogens were isolated from cultures of these sterile saline solutions. We also reviewed microbiological data from the previous year at the patient's referring facility (where he received multiple intramuscular analgesic injections and a colonoscopy with biopsy) to identify any cultures positive for *P. fluorescens*. Three patients were found to have *P. fluorescens* from diagnostic cultures, but we found no epidemiological link to our patient. In addition, these isolates' resistance profiles differed from our patient's isolate.

In our patient, *P. fluorescens* was initially misidentified as a *Burkholderia* species using an automated system, highlighting potential diagnostic pitfalls with genus- and species-level identification of these clinically and phenotypically similar organisms. Studies have shown misidentification at the genus level between *Burkholderia* and *Pseudomonas*, as well as at the species level between *Pseudomonas* isolates using biochemical testing methods, including automated testing systems.[7,8] Differential growth at 4°C and 42°C can also help in differentiating *Pseudomonas* species phenotypically, with *P. aeruginosa* showing growth at 42°C and *P. fluorescens* showing growth at 4°C. This patient's isolate was not cultured for growth at 42°C; however, its growth at the lower temperature further supports its identification as *P. fluorescens*. In the past decade, studies have also supported the use of genotypic and molecular confirmatory tests for the identification of many nonfermenting gram-negative rods.[8–10] Unfortunately, confirmatory testing was not performed on the case isolate, as it was discarded by the laboratory upon the patient's hospital discharge.

Bacterial septic sacroiliitis is an uncommon infection, the nonspecific presentation of which can lead to delayed diagnosis. Four major reviews[11–14] revealed fewer than 500 unique cases of non-brucellar, non-tubercular bacterial septic sacroiliitis reported between 1878 and 2011. Often acquired by the hematogenous route, the condition is most common in the second and third decades of life, coinciding with the period of peak vascularity in the SI joint.[12–15] Whereas no predisposing factors are found in 41% of cases, the majority have at least one risk factor: concurrent infection, immune-compromised state, intravenous drug use, pregnancy, contiguous spread, direct inoculation, or trauma.[11–13,16] Our patient fit the characteristic age demographic for septic sacroiliitis and had only one identifiable risk factor, which was antecedent trauma.

Clinically, septic sacroiliitis may present acutely (75%) or subacutely (25%),[12] and the clinical triad of fever, low-back pain, and weight-bearing difficulty may be seen in 70% of patients.[17] Our patient's course was subacute, presenting with low-back pain and difficulty weight-bearing but no fever. In contrast to spondyloarthropathies, septic sacroiliitis tends to be unilateral, with less than 2% of cases presenting bilaterally.[12,13] Abdominal pain, as seen in our patient, is found in 13% of patients with septic sacroiliitis and has led to unnecessary exploratory laparotomy in 39% of patients in 1 series.[18] As in our case, physical findings consistent with SI joint involvement include maximal tenderness over the SI joint and limited ipsilateral straight leg raise. Pain with pelvic or SI joint compression and positive Gaenslen or FABERE (flexion, abduction, external rotation, and extension) maneuvers can also be seen.[12,13,15]

Our patient presented with normal hematologic parameters and elevated inflammatory markers. Leukocytosis has historically shown low sensitivity and specificity, and elevated inflammatory markers, though sensitive, are not specific for septic sacroiliitis.[12,17] Our patient had normal CT findings 2 months before admission, which, along with his nonspecific presentation, may have delayed diagnosis until his return for hospital admission. In a series of 33 patients with septic sacroiliitis,[17] technetium-99m or gallium-67 bone scintigraphy was found to have the highest sensitivity (93%), followed by MRI (85%), CT (36%), and plain films (12%). However, other authors have reported greater diagnostic accuracy with MRI for infectious sacroiliitis.[13,19] This discrepancy may be because of a sampling error in the 33-patient series, as bone scintigraphy was conducted more frequently ($n = 30$) than MRI ($n = 13$). MRI is often preferred because of the detail it provides in assessing cartilage integrity, osseous erosions, bone marrow edema, joint effusions, and soft tissue abscesses.[11,13,17,19] As was reported in this case, CT can be used to guide arthrocentesis.[12] Our patient's serial SI joint imaging revealed a dramatic interval change from the preceding CT image 2 months before admission. After definitive diagnosis and targeted treatment, serial MRIs revealed a dramatic and rapid response to oral antimicrobial therapy.

Microbiologic diagnosis of septic sacroiliitis may be enhanced by the finding of positive blood cultures (23–69% sensitivity)[12,14] or more directly by synovial fluid culture (50–88% sensitivity).[12,17,20] Sacroiliitis is most often caused by gram-positive cocci (82% in one series), primarily *Staphylococcus aureus* (67% of total cases).[11,13,14] In contrast, gram-negative species account for 18% of cases, with *Salmonella* species most commonly recovered (6% of total cases), the fluorescent pseudomonad family accounting for 5% of total cases,[13,14] and *P. aeruginosa* closely associated with intravenous drug use.[12,13]

Empiric treatment of septic sacroiliitis should include agents active against *S. aureus*, with additional agents directed at *P. aeruginosa* if intravenous drug use is a clinical concern.[12] Two-to-six weeks of culture-directed antibiotic therapy should

be provided, with some authors recommending up to 12 weeks of therapy or until full clinical and/or radiographic resolution is achieved.[12–14,17] Although medical therapy is sufficient in most cases, surgery may be indicated for abscess, osteomyelitis, a sequestrum of necrotic bone, or failure to show clinical improvement with intravenous antibiotics within 24 to 48 hours.[12,13,15,17] Despite persistent radiologic changes, only around one-third of treated patients incur chronic disability.[12,17] In this case, the clinical response was favorable and radiologic improvement was observed after 2 weeks of antimicrobial therapy.

In this novel report of septic sacroiliitis because of *P. fluorescens*, we describe clinical and imaging findings, highlight potential microbiological diagnostic pitfalls, and show a prompt clinical response to targeted oral antimicrobial therapy. Although optimal antimicrobial treatment duration for infectious sacroiliitis is not well established, this case shows the early efficacy of oral antibiotics. Enhanced microbiological diagnostic techniques beyond routine culture and susceptibility testing should also be considered to account for less commonly seen pathogens. Increased awareness of septic sacroiliitis as a potential disease process in the differential diagnosis of troops presenting with a combination of fever, low-back pain, and weight-bearing difficulty is important. As the young age and trauma exposure of the military population represents a prime demographic for this often unrecognized infection, delayed diagnosis can negatively impact a soldier's military readiness.

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